

REPORT DOCUMENTATION PAGE			Form Approved OMB NO. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comment regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE	3. REPORT TYPE AND DATES COVERED <i>Final</i>	
4. TITLE AND SUBTITLE Symposium on Recent Developments in Elasticity			5. FUNDING NUMBERS <i>DAAH04-95-1-0590</i>	
6. AUTHOR(S) R. C. Batra				
7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(ES) Virginia Polytechnic Institute and State University Blacksburg, VA 24061-0219			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Research Office P.O. Box 12211 Research Triangle Park, NC 27709-2211			10. SPONSORING / MONITORING AGENCY REPORT NUMBER <i>ARO 34687.1-MA-CF</i>	
11. SUPPLEMENTARY NOTES The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited.			12 b. DISTRIBUTION CODE 19960909 058	
13. ABSTRACT (Maximum 200 words) The symposium on Recent Developments in Elasticity was held at The Johns Hopkins University in Baltimore on June 12-15, 1996 in conjunction with the 1996 ASME Mechanics and Materials Conference. The symposium had the twin purpose of honoring Jerald L. Ericksen and reviewing the field to which he has contributed immensely. The symposium was organized by Professor Millard F. Beatty of the University of Nebraska-Lincoln and Professor R. C. Batra of the Virginia Polytechnic Institute and State University. In response to the Call for Papers published in various journals and personal invitations 70 abstracts were received. These were reviewed and 60 accepted abstracts were organized into ten sessions. Thirty-nine manuscripts were received for publication in the volume "Contemporary Research in the Mechanics and Mathematics of Materials". These were edited, and grouped into the following sections: Distinguished paper, Biomechanics, Continuum Mechanics, Finite Elasticity, Liquid Crystals, Phase Transformations, Porous Materials, Thermoelasticity, Topics in Linear Elasticity. The book edited by R. C. Batra and M. F. Beatty will be published by the International Center for Numerical Methods in Engineering, Barcelona, Spain by the end of 1996.				
14. SUBJECT TERMS Linear Elasticity, Finite Elasticity, Continuum Mechanics, Liquid Crystals, Biomechanics, Porous Elastic Materials, and Thermoelasticity			15. NUMBER IF PAGES	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OR REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UL	

Symposium on Recent Developments in Elasticity
Baltimore, MD June 12-15, 1996

Final Report

R. C. Batra

August 1996

U.S. Army Research Office
Grant Number DAAH04-95-1-0590

Department of Engineering Science and Mechanics
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061-0219

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Program of the Symposium on Recent Developments in Elasticity

The Johns Hopkins University
Baltimore, MD, June 12-15, 1996

(Organizers: R. C. Batra and M. F. Beatty)

June 12, 1996 (Afternoon)

Session 1

Chair: R. C. Batra, Virginia Tech

1. C.A. Truesdell, 4820 Greenway, Baltimore, MD **(TENTATIVE)**
"Opening Remarks"
2. M.F. Beatty, University of Nebraska, Lincoln, NE (5 minutes)
"Remarks on J.F. Bell's paper - The Kinematics of Large Plastic Strain in Cubic Single Crystals: A New Look in the Laboratory at G.I. Taylor's Analysis of Finite Shear on Face Diagonals".
3. W. Noll, Carnegie-Mellon University, Pittsburgh, PA
"On Frame-Indifference"
4. I. Müller, Technical University, Berlin
"Entropy of Radiation - Density, Flux and Production"
5. C. Dafermos, Brown University, Providence, RI
"Quasiconvex Entropy in Elastodynamics"
6. S.S. Antman, University of Maryland, College Park, MD
"Viscosity in Solids"
7. B.D. Coleman, Rutgers University, Piscataway, NJ
"Applications of Topology and Elasticity Theory to Problems in Molecular Biology"

June 12, 1996 (Afternoon)

Session 2:

Chair: M. F. Beatty, University of Nebraska-Lincoln

1. F.M. Leslie, Strathclyde University, Scotland
"Elasticity of Smectic C Liquid Crystals"
2. G.G. Peroli, Università di Pisa, Italy
E.G. Virga, Università di Napoli *Federico II*, Italy
"Capillary Locking of Point Defects in Nematics"
3. Weinan E., Courant Institute of Mathematical Sciences, New York, NY
"Formation and Dynamics of Filaments in the Isotropic-Smectic A Transition"
4. G. Capriz, Università di Pisa, Italy
"Smectic Elasticity"
5. P. Cermelli, Università di Torino, Italy
F. Pastrone, Università di Torino, Italy
"Homotopy Groups and Defects in Elastic Solids"
6. R.J. Atkin, University of Sheffield
I.W. Stewart, University of Strathclyde
"Static Solutions for Smectic C Liquid Crystals"

June 13, 1996 (Afternoon)

Session 3

Chair: Andrew Marris, 3372 Embury Circle, Atlanta, GA

1. X. Markenscoff, University of California, San Diego, CA
M. Paukshto, Saint-Petersburg State University
"The Cosserat Spectrum in the Theory of Elasticity and Applications"
2. P.A.C. Raats, Research Institute for Agrobiolgy and Soil Fertility, Haren, Netherlands
"Finite Deformations in the Soil and Plant Sciences"
3. Z. Wesolowski, Institute of Fundamental Technological Research, Warsaw, Poland
"One-Dimensional Model of Drying of Porous Material"
4. K. Wilmanski, University of Essen, Essen, Germany
"Dynamics of Porous Materials Under Large Deformations and Changing Porosity"
5. P. Giovine, Università degli Studi di Reggio Calabria, Calabria, Italy
"Porous Solids as Materials with Ellipsoidal Structure"
6. K.A. Pericak-Spector, Southern Illinois University, Carbondale, IL
S.J. Spector, Southern Illinois University, Carbondale, IL
"Dynamic Cavitation with Shocks in Nonlinear Elasticity"

June 13, 1996 (Afternoon)

Session 4

Chair: D. Carlson, University of Illinois-Urbana

1. J. Dunwoody, The Queen's University of Belfast, Northern Ireland
"Controlled Thermoelastic Deformations"
2. G.G. Ciobanu, Universitatea "Al. I. Cuza" Iasi, Romania
"Some Results in the Theory of Thermoelasticity with Heat Flux Equation"
3. H.W. Haslach, Jr., University of Maryland, Baltimore, MD
"Nonlinear Thermoviscoelastic Relaxation"
4. R. Fosdick, University of Minnesota
"The Rushbrooke Inequality in Nonlinear Thermoelasticity"
5. G.A. Maugin, Université Pierre et Marie Curie, Paris, France
"On Ericksen-Noether Identity and Material Balance Laws in Thermoelasticity and Akin Phenomena"
6. J. Casey, University of California, Berkeley, CA
S. Krishnaswamy, University of California, Berkeley, CA
"On Constrained Thermoelastic Materials"

June 14, 1996 (Afternoon)

Session 5

Chair: James Serrin, University of Minnesota, Minneapolis, MN

1. M. Pitteri, Università di Padova, Padova, Italy
G. Zanzotto, Università di Padova, Padova, Italy
"Transformation Twinning and Mallard's Law"
2. N.K. Simha, Caltech, Pasadena, CA
L. Truskinovsky, University of Minnesota, Minneapolis, MN
"Phase Diagram of Zirconia in Stress Space"

3. L. Truskinovsky, University of Minnesota, Minneapolis, MN
"Fracture as a Phase Transition"
4. R.V. Kohn, New York University, New York, NY
V. Lods, Université de Paris VI, Paris, France
"Incompatibility, Hysteresis, and the Two Well Problem"
5. I.-S. Liu, Universidade Federal do Rio de Janeiro, Brazil
"Numerical Solutions for Phase Transitions in Elasticity"
6. M. Luskin, University of Minnesota, Minneapolis, MN
"The Computation of Material Microstructure"

June 14, 1996 (Afternoon)

Session 6

Chair: S. L. Passman, Sandia National Lab., Albuquerque, NM

1. A. DeSimone, Università di Roma "Tor Vergata", Roma, Italy
"Elastic Deformations Induced by Applied Magnetic Fields"
2. D. Kinderlehrer, Carnegie Mellon University, Pittsburgh, PA
C. Liu, Carnegie Mellon University, Pittsburgh, PA
"Revisiting the Focal Conic Structures in Smectic A"
3. R.D. James, University of Minnesota, Minneapolis, MN
"Wiggly Energies"
4. K. Bhattacharya, California Institute of Technology, Pasadena, CA
"Kinematics of Crossing Twins"
5. X. Zhong, California Institute of Technology, Pasadena, CA
R.C. Batra, Virginia Tech, Blacksburg, VA
"Modeling of Macroscopic Response of Phase Transforming Materials Under Quasistatic Loading"
6. Z. Bo, Texas A&M University, College Station, TX
D.C. Lagoudas, Texas A&M University, College Station, TX
"Phase Transformation Localization in SMA Wires"

June 15, 1996 (Morning)

Session 7

Chair: J. Jenkins, Cornell University

1. G. Mazzini, University of Pisa, Pisa, Italy
"The Sigma-Algebra of Bodies in Continuum Mechanics"
2. D. Owen, Carnegie-Mellon University, Pittsburgh, PA
"Yield, Hysteresis, and Structured Deformations"
3. C. Trimarco, Università di Pisa, Pisa, Italy
"Classical Continua with Microspin"
4. R. Segev, Ben-Gurion University, Beer-Sheva, Israel
M. Epstein, The University of Calgary, Alberta, Canada
"On Theories of Growing Bodies"
5. A. Di Carlo, Terza Università degli Studi di Roma, Roma, Italy
"A Non-Standard Format for Continuum Mechanics"

6. E. Benvenuto, , M. Corradi and F. Foce
Università di Genova, Istituto di Costruzioni-Genova, Italy
"Metaphysical Roots of the Nineteenth Century Debate on the Molecular Theory of Elasticity"

June 15, 1996 (Morning)

Session 8

Chair: Lewis Wheeler, University of Houston, Houston, TX

1. E. Pucci, Università di Perugia, Roma, Italy
G. Saccomandi, Università LA SAPIENZA, Roma, Italy
"Universal Relations in Finite Elasticity"
2. Ph. Boulanger, Université Libre de Bruxelles, Bruxelles, Belgium
M. Hayes, University College, Dublin, Ireland
"Largest and Least Phase and Energy Speeds for Plane Waves in Deformed Mooney-Rivlin Materials"
3. T.W. Wright, Army Research Laboratory, Aberdeen Proving Ground, MD
G. Ravichandran, California Institute of Technology, Pasadena, CA
"On Shock-Induced Damage in Ceramics"
4. C.-S. Man, University of Kentucky, Lexington, KY
"Acoustoelastic Measurement of Residual Stress"
5. R.W. Ogden, University of Glasgow, Scotland
Y.B. Fu, University of Manchester, Manchester, United Kingdom
"Nonlinear Stability Analysis of a Pre-stressed Elastic Half-space"
6. A.J. Levy, Syracuse University, Syracuse, NY
"Cavity Formation at an Inclusion in a Remote Compression Field"

June 15, 1996 (Afternoon)

Session 9

Chair: C. O. Horgan, University of Virginia, Charlottesville, VA

1. Y.-C. Chen, University of Houston, Houston, TX
L.T. Wheeler, University of Houston, Houston, TX
"Flexure of Inflated Elastic Membranes"
2. G.J. Ruddock, University of Nottingham, Nottingham, England
A.J.M. Spencer, University of Nottingham, Nottingham, England
"Solidification and Consequent Thermoelastic Distortion of a Fibre-Reinforced Slab"
3. M. El Mouden, Université de Metz, Metz, France
M. Cherkaoui, Université de Metz, Metz, France
M. Berveiller, Université de Metz, Metz, France
"Elastic Composite with Periodically Distributed Coated Inclusions: A Micromechanical Approach"
4. W.L. Yin, Georgia Institute of Technology, Atlanta, GA
"Evaluation of the Stress Intensity Factors in the General Delamination Problem"
5. C. Davini, Università Degli Studi di Udine, Udine, Italy
"On Babuska Paradox in the Theory of Elastic Plates"
6. D.Y. Gao, Virginia Tech, Blacksburg, VA
D.L. Russell, Virginia Tech, Blacksburg, VA
"Finite Deformation Extended Beam Theory and Nonlinear Buckling Analysis"

June 15, 1996 (Afternoon)

Session 10

Chair: Mike Scheidler, Army Research Laboratory, Aberdeen Proving Ground, MD

1. J.D. Humphrey, University of Maryland, Baltimore MD,
W.C. Hunter, The Johns Hopkins University, Baltimore, MD
and F.C.P. Yin, The Johns Hopkins University, Baltimore, MD
"Constitutive Formulations in Cardiac Mechanics"
2. A.A. Spector, The Johns Hopkins University, Baltimore, MD
W.E. Brownell, Baylor College of Medicine, Houston, TX
A.S. Popel, The Johns Hopkins University
"A Model of Elastic Properties of Cell Membranes"
3. R.K. Bera, Technical Teachers' Training Institute, West Bengal, India
"Non-Linear Equations for a Shallow Un-Symmetrical Sandwich Shell of Double Curvature - A New Approach"
4. V. Mizel, Carnegie Mellon University, Pittsburgh, PA
"Remarks on Isotropic Polyconvexity"
5. J.F. Bell (deceased), The Johns Hopkins University, Baltimore, MD
Eveline Baesu (Graduate Student), University of California, Berkeley, CA
"On the Symmetry and Coaxiality of Pertinent Stretch and Stress Tensors during Non-Proportional Loading at Finite Strain"
6. P. Villaggio, University of Pisa, Pisa, Italy
"The Thickness of the Roman Arch"
7. P. Podio-Guidugli, Università di Ingeger di Roma (Tor Vergata)
A. DeSimone, Università di Ingeger di Roma (Tor Vergata)
"The Construction of Stress Fields in the Presence of Self-Interactions"
8. G.G. Peroli, Università di Pisa, Italy
"Annihilation of Point Defects in Nematics"

Contemporary Research in the Mechanics and Mathematics of Materials

Edited by

R. C. Batra
Virginia Tech
Blacksburg, VA 24061-0219

and

M. F. Beatty
University of Nebraska
Lincoln, NE 68588-0347

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Dedication and Acknowledgements

Papers included in this volume were presented at the Symposium on Recent Developments in Elasticity held to commemorate Professor Jerald L. Ericksen's 70th birthday on 20 December 1994. These papers and others offered at the symposium are dedicated to him in recognition of his broad contributions to the mechanics and mathematics of materials, and for his providing inspiration to numerous individuals many of whom participated in this symposium. Most of the participants are specifically indebted to him for providing insightful ideas and directions for research in Elasticity, Liquid Crystals and Continuum Mechanics, a few out of several areas to which he has contributed immensely. The symposium was held at the Johns Hopkins University on June 12-15, 1996, as a part of the 1996 ASME Mechanics & Materials Conference.

The editors are grateful to Clifford Truesdell for providing guidance at various crucial stages in preparation of the program. We thank an anonymous donor for providing up to \$1,000 to support a promising graduate student for the purpose of participating in the symposium. The gift was awarded to Eveline Baesu, a graduate student in the Department of Mechanical Engineering at the University of California, Berkeley, and coauthor of a recent paper with Professor James F. Bell, a close friend and colleague of Professor Ericksen's for forty years. Even though every attempt was made to contact Professor Ericksen's former colleagues, students, postdoctoral fellows and associates, we apologize to those whom we were unable to write and inadvertently missed.

We thank Mrs. Norma Guynn at VPI and Elaine Malone and Betty Stukenholtz at UNL for their assistance with the preparation and mailings of all symposium materials and with the preparation of portions of this volume.

Each paper was reviewed carefully by at least one of us. In the interest of having the volume available at the Symposium, only those papers accepted before March 8 are included in the volume. The editors are grateful to the authors for their cooperation, and for contributing to the success of the symposium and to creation of this volume. They are equally grateful to other participants of the symposium who presented their research findings, contributed to discussions, chaired a session, and/or shared their ideas with others. The organization of the symposium was partially supported by the Army Research Office grant DAAH04-95-1-0590 to the Virginia Polytechnic Institute and State University.

R. C. Batra and M. F. Beatty